Building the Ecosystem for ARM Servers

Enterprise-Class Software Capabilities Provide Foundation for Future Adoption of ARM Servers

Executive Summary

Enterprise IT and cloud service providers have shifted their focus away from server buying criteria that are based on performance-per-dollar and toward metrics that encompass total cost of ownership (TCO) for the lifecycle of a server. In addition, these organizations are moving away from a “one size fits all” approach to their server purchases and toward solutions that are optimized for each of their workloads. This shift in thinking opens the door for alternative architectures to emerge with solutions that are right-sized and optimized for specific workloads and applications.

Over the last several years, ARM Holdings and its partners have entered the server market with a mission to provide a TCO benefit for a number of cloud and high-performance computing applications. The market for ARM servers is still in an early phase, as building an ecosystem is a multiyear process that requires long-term commitment by contributors across the industry. Operating system vendors (OSVs) and independent software vendors (ISVs) are critical players in the ecosystem that helped provide the foundation for open source community enablement and collaboration, and they will enable enterprise developers to optimize their applications on ARM. In addition, OSVs and ISVs are working closely with system vendors and end users to demonstrate the potential benefits of ARM servers for workloads at the proof-of-concept level—which will help drive demand for future production deployments of ARM servers.

Red Hat has been a contributor to the ARM server ecosystem since its inception with a phased enablement approach that began with participation in upstream projects, followed by integration with the community on platform enablement. Red Hat has made available the Red Hat Enterprise Linux Server for ARM Development Preview (RHELSA) to help transition the partner ecosystem to the next phase of stabilizing products, platforms, and solutions to enable broader ARM server adoption in the future.

Moor Insights & Strategy (MI&S) believes that common functionality across architectures and an enterprise-class feature set are required to build a solid software foundation for broader acceptance of ARM servers. When it comes to enterprise Linux, Red Hat’s proven leadership in supporting multiple architectures and broad experience with enterprise and cloud service provider customers put them in a strong position to deliver a unified datacenter experience.

IT Organizations are Looking for Efficiency

Over the last decade, large scale datacenters have been driving the industry to provide more efficient server designs that optimize performance while lowering operating costs like power, space, cooling, and maintenance. These hyperscale best practices are now making their way into mainstream enterprise and cloud service provider datacenters, resulting in a shift away from performance-per-dollar (CAPEX only) as the primary

decision criterion and toward total cost of ownership (which includes both CAPEX and OPEX). In addition, rather than using general-purpose solutions to service all of their applications, large-scale enterprise IT organizations and cloud service providers are looking for solutions that are optimized for each workload. Workload optimization drives the need for solutions with different levels of compute, memory, network, storage, and unique workload acceleration technologies. The server ecosystem has responded with solutions that are focused on providing optimal TCO for each workload.

ARM and its partners have emerged over the last several years with server-optimized SoC (system on chip) products that are designed to reduce TCO for cloud, massive hyperscale, and high-performance computing applications. ARM has a longstanding history of providing processors that use very little power. As datacenters grow, power consumption, cooling needs, and physical space require greater capital outlays. With this in mind, many ARM server SoC vendors are focused on solutions that provide greater density, drive down power, and deliver higher performance-per-watt at a reduced cost point over competitive solutions. However, it remains to be seen if ARM's historical strength in power efficiency will hold true for ARM-based server SoCs when compared to competitive Intel x86-based server processors and SoCs.

Building an Ecosystem

ARM and its partners have been working for a number of years to build up an ecosystem that is capable of delivering optimized solutions which provide lower TCO than competitive offerings. Building a robust ecosystem takes many years and a strong community of hardware vendors, software vendors, end users, and other industry experts who are committed to the cause for the long-term.

On the hardware side, a number of vendors have announced plans to design with ARM-based server SoCs including AMD, AppliedMicro, Broadcom, and Cavium. Some of these vendors have started shipping production silicon, while others are still in the product development phase. Each vendor's approach is unique with various design points and targets for specific workloads and market segments. In October 2015, Qualcomm officially joined the party by revealing more specifics about their ARM server SoC plans, including partnerships to enable workload acceleration with Xilinx for FPGA-based acceleration and Mellanox for Ethernet and InfiniBand interconnect acceleration. MI&S believes acceleration technologies for specific workloads will be one of the critical elements required for ARM server SoCs to compete with Intel Xeon-based solutions.

On the software side, one of the key goals for ARM ecosystem enablement is to build consistency of user experience across the various ARM server SoC implementations. In addition, IT organizations desire consistency of boot environments, manageability, and other underlying software infrastructure components to their existing x86-based solutions. In an effort to build this consistency and accelerate the pace of ecosystem enablement, Linaro Enterprise Group (LEG) was formed with contributions from companies across the industry to enable the development of foundational software for Linux on ARM-based servers. In addition, ARM and its partners have collaborated to create two platform standards—the Server Base System Architecture (SBSA)

specification and Server Base Boot Requirements (SBBR)—which are also an effort to create consistency and compatibility across ARM server implementations.

On the server solution side, HP was the first global OEM to launch an ARM-based server with their AppliedMicro X-Gene-based HP Moonshot cartridge in 2014. A few regional server OEMs have introduced ARM server solutions designed to enable proof-of-concept deployments, and Dell has demonstrated two different ARM-based evaluation platforms over the last few years. End users from sectors such as hyperscale computing, cloud service providers, and high-performance computing are currently in the proof-of-concept phase with ARM-based servers. However, there have been no large-scale production-level deployments of ARM-based servers announced to date.

Ecosystem Maturity Required for Broad Adoption

One of the key factors to drive broader adoption of new architectures in the datacenter includes an ecosystem that has the following attributes:

- **Enterprise-Class Features**: Enterprise IT demands a set of table stakes capabilities such as robust systems management, security, and reliability across all of the solutions in their datacenter.
- **Adherence to Standards**: IT requires a set of standards for all new platforms including a consistent boot environment, common systems management framework, and common operating systems feature sets across architectures.
- **Proven Scalability**: IT organizations need to have the confidence that a new architecture has the ability to scale when moving from proof-of-concept evaluations to a large-scale production deployment.
- **Consistent User Experience**: It is important for new architectures to provide a consistent user experience when compared to incumbent solutions and across the various flavors of vendor implementations of a new architecture. A user experience that is familiar for IT will help eliminate one more hurdle to adoption.

OSVs and ISVs are foundational members of the ecosystem to help enable these capabilities for a new architecture. OSVs and ISVs provide the glue that allows the open source community to adhere to a common set of open standards. They work closely with system vendors on developing optimized, scalable platforms.

Red Hat believes their approach to 64-bit ARM ecosystem enablement is aligned with driving ecosystem maturity and adoption across hyperscale, cloud, and enterprise datacenters. The Red Hat Enterprise Linux Server for ARM Development Preview (RHELSA) became available in June 2015 as an unsupported offering designed to enable partner efforts around product and software development. Red Hat's design approach is focused on using a single operating platform (binary / kernel) across multiple 64-bit ARM SoCs while using the same sources to build user functionality and consistent feature set between RHELSA and Red Hat Enterprise Linux running on other architectures. Red Hat's goal is to provide its customers with the ability to integrate ARM architecture seamlessly into their existing infrastructure environments.

Red Hat's Approach to Ecosystem Enablement for ARM Servers

Red Hat's delivery of RHELSA Development Preview was a culmination of multiyear participation in the ARM server ecosystem community.

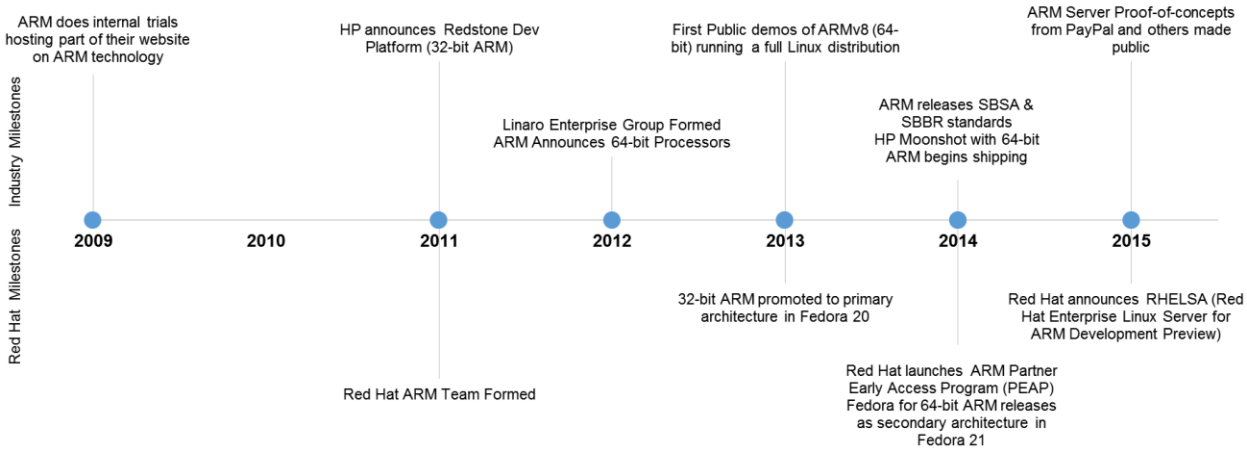
Red Hat took a pragmatic approach to their involvement in the ARM server ecosystem which began with participation in upstream projects followed by integration with the community on platform enablement. RHELSA Development Preview is designed to help transition the partner ecosystem to the next phase of stabilizing products, platforms, and solutions to enable broader adoption in the future.

Figure 1 provides a timeline of key milestones thus far for the ARM ecosystem including some Red Hat-specific milestones.

RHELSA Simplifies ARM Server Evaluation for a Large HPC Customer

"RHELSA simplified integration with our current architecture."
"We successfully tested HPCC-oriented benchmarks."
"For us, RHEL7 on ARM is a major step for using ARM in our HPC environment. This step was passed and we can now really think to put ARM into real HPC production."

Figure 1: Major Milestones for the ARM Server Ecosystem



Since 2011 when the company first began its ARM server efforts, Red Hat was an early participant in ecosystem efforts such as LEG and the ARM SBSA / SBBR definition. In addition, Red Hat was a major driver behind the OpenJDK port for ARM 64-bit servers—a key software element required to help further the ecosystem. Red Hat has partnered with all of the key ARM server SoC vendors on the enablement of early prototype systems. In 2014, the Red Hat Partner Early Access Program (PEAP) was announced to help enable 64-bit ARMv8-A architecture through Red Hat's partnerships with 40+ companies including IHVs, silicon vendors, OEMs, ODMs, and ISVs.

Red Hat is working with its partners to enable end users on proof-of-concept evaluations of ARM servers. As the name suggests, RHELSA Development Preview is designed for development purposes and is considered an unsupported release.

Call to Action

ARM server adoption by end users remains in the early phase with a number of proofs-of-concept underway. The ecosystem has been growing over the last 6 years, and the majority of the foundational elements are now in place. ARM server SoC vendors, system providers, and others in the ecosystem are now in the process of developing solutions that are optimized for specific workloads and proving out TCO value vs. incumbent x86 servers.

OSV and ISV partners in the ARM ecosystem will be foundational to drive ecosystem maturity, enterprise developer engagement, and application optimization during the proof-of-concept phase. Red Hat has taken a pragmatic approach to their participation in the ARM server market over the last several years with the understanding that building an ecosystem for a new architecture is a multi-year effort. RHELSA Development Preview is now available through Red Hat's server hardware partners and is intended to enable proof-of-concept evaluations. When it comes to enterprise Linux, Red Hat's proven leadership in supporting multiple architectures and broad experience with enterprise and cloud service provider customers put them in a strong position to deliver a unified datacenter experience.

RHELSA Development Preview has the right set of capabilities for those looking to evaluate ARM servers with the intention of eventual production deployments. IT organizations and enterprise developers looking to evaluate ARM servers and optimize their applications for ARM should ensure they ask about the RHELSA Development Preview from their SoC and system vendors of choice.

Important Information About This Brief

Inquiries
Please contact us here if you would like to discuss this report, and Moor Insights & Strategy will respond promptly.

Citations
This note or paper can be cited by accredited press and analysts, but must be cited in-context, displaying author's name, author's title, and "Moor Insights & Strategy". Non-press and non-analysts must receive prior written permission by Moor Insights & Strategy for any citations.

Licensing

Disclosures
This paper was commissioned by Red Hat, Inc. Moor Insights & Strategy provides research, analysis, advising, and consulting to many high-tech companies mentioned in this paper. No employees at the firm hold any equity positions with any companies cited in this document.

DISCLAIMER
The information presented in this document is for informational purposes only and may contain technical inaccuracies, omissions, and typographical errors. Moor Insights & Strategy disclaims all warranties as to the accuracy, completeness, or adequacy of such information and shall have no liability for errors, omissions, or inadequacies in such information. This document consists of the opinions of Moor Insights & Strategy and should not be construed as statements of fact. The opinions expressed herein are subject to change without notice.

Moor Insights & Strategy provides forecasts and forward-looking statements as directional indicators and not as precise predictions of future events. While our forecasts and forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. You are cautioned not to place undue reliance on these forecasts and forward-looking statements which reflect our opinions only as of the date of publication for this document. Please keep in mind that we are not obligating ourselves to revise or publicly release the results of any revision to these forecasts and forward-looking statements in light of new information or future events.